Yangon University of Economics
Post Graduate Diploma in Research Studies (PGDRS) Progamme
Third Quarter Examination, March 2024

PGDRS-312

PGDRS (9th Batch) **Forecasting Methods**

Answer **All** Questions. **Time Allowed: 3 hours**

1. (a) Describe the widely used forecasting methods in practice. How do you select the right forecasting techniques?
   (b) When should the qualitative forecasting methods be used? Give an example. Define the common methods of qualitative forecasting.

2. (a) What are the methods of forecasting a time series having no consistent trend?
   (b) Data on the total production of paddy (in tons) in a certain region from 2009 to 2023 are as follows.

Year	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Production	65	72	74	62	64	68	71	74	75	63	65	69	70	72	74

   (i) Calculate the 3 term moving averages for the data. Plot the original series and moving average series on the same graph. Compute SE.
   (ii) Use exponential smoothing technique. Take $\alpha = 0.3$. Plot the original series and exponentially smoothed series on the same graph. Compute SE.
   (iii) Compare the two smoothing methods based on SE and the plots in (i) and (ii).
   (iv) Obtain the forecast for year 2024.

3. (a) Distinguish between the linear trend and exponential trend and quadratic tend models.
   (b) The data below represents virous infections per month per 1000PCs during 2014-2023.

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Viruses	10	21	43	70	91	104	115	120	129	140

   (i) Make an Excel line graph of the data on computer viruses.
   (ii) Fit three trends (linear, exponential and quadratic) to the series.
   (iii)Which trend model is the best and why? (Use R square, MAPE, ANOVA and t test)
   (iv)Forecast for 2024 using a trending model of your choice in (iii).

4. (a) How do you understand seasonal variation of a time series?
   (b) The following data represent quarterly sales of umbrella (in unit) of a Supermarket in Yangon beginning with the 1st quarter of 2020 and ending with 4th quarter of 2023. Assuming the multiplicative model is appropriate for the data.

Quarter	2020	2021	2022	2023
1	89	108	120	78
2	90	115	125	80
3	92	126	134	84
4	96	133	142	87

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(i) Plot the data and do you find any seasonal variation in the data?
(ii) Compute seasonal indexes and comment.
(iii) Find the deseasonalized data.
(iv) Fit a linear trend to the deseasonalized data.
(v) Find the forecast sales for 2024.

5. The data on monthly electricity bills ('000 kyats) for a residence during 2020 and 2023 are shown below.

Month	2020	2021	2022	2023
Jan	7747	78.98	80.16	82.18
Feb	84.44	86.62	88.34	90.63
Mar	95.54	96.43	97.52	98.01
Apr	97.60	98.16	99.14	99.99
May	87.93	88.52	90.68	92.87
Jun	80.12	83.34	84.16	86.34
Jul	78.57	80.16	82.25	84.55
Aug	64.82	66.61	68.17	70.73
Sep	69.02	70.07	72.45	75.45
Oct	64.09	66.15	69.07	71.98
Nov	63.43	65.04	66.89	68.12
Dec	62.25	63.08	65.43	66.97

(a) Plot the monthly electricity bills data. Do you see seasonal pattern? Explain.
(b) Use the Excel to perform a regression using seasonal binaries (Exclude Dec to prevent perfect multicollinerity). Interpret the results.
(c) Use the regression equation to forecast for the electricity bill of each month in 2024.
